ASTR 110 INTRODUCTION TO ASTRONOMY

CRN 61028, Credits: 3
MW 10:00-11:15AM, Imiloa 133

INSTRUCTOR: **Marvin Kessler**
OFFICE: **Hale Imiloa 136**
OFFICE HOURS: **MW, 11:15AM-12:30PM**
TELEPHONE: **222-6573** **EMAIL: mkessler@hawaii.edu**
EFFECTIVE DATE: **FALL 2017**

WINDWARD COMMUNITY COLLEGE MISSION STATEMENT

Windward Community College offers innovative programs in the arts and sciences and opportunities to gain knowledge and understanding of Hawai'i and its unique heritage. With a special commitment to support the access and educational needs of Native Hawaiians, we provide O'ahu's Ko'olau region and beyond with liberal arts, career and lifelong learning in a supportive and challenging environment — inspiring students to excellence.

CATALOG DESCRIPTION

Introduction to the astronomical universe for non-science students. (3 hrs. lect.)

Activities Required at Scheduled Times Other Than Class Times

One Star-Gazing show at the Imaginarium. These shows are held at 7:00 PM on the second Wednesday of each month. Substitution is permitted if student is unable to attend at that time because of work commitment or similar serious impediment. Substitution must be approved by instructor.

STUDENT LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

- Outline the development of astronomy from ancient times to present and explain the role of the scientific method in this historic context.
- Describe and explain the apparent motions of the celestial bodies, especially as related to naked-eye observations.
- Identify the appropriate instruments used by astronomers to understand the universe.
- Outline the origins of our solar system and appraise the leading cosmological theories of the origin of the universe.
- Describe the physical and chemical properties of the objects in our solar system and apply the concept of comparative planetology.
- Describe the physical and chemical nature of stars, and especially our sun, and apply the astronomical techniques used to measure stellar properties.
- Outline the evolutionary stages in a star's life and compare and contrast the structure of our Milky Way and other galaxies.
- Apply astronomical concepts to the search for extraterrestrial life.

COURSE TASKS

1. **Division of time**

Class on Monday will be devoted to lecture and assignments. Important sections of the textbook will be highlighted. The focus of this first class of the week will be to listen, take direction, and read. Between Monday and Wednesday the student should read the pertinent pages of the textbook, outline them, and answer the assigned questions at the end of the chapter.

Class on Wednesday will be devoted to reports by students on the questions that were assigned on Monday. Extensive use will be made of the workbook, *Lecture Tutorials for ASTR 110 and ASTR 110WI*. There will be use of dyads and small groups for discussion. This is a day that will focus on active learning. At the end of the class there will usually be time to write a "one minute paper" or take a short quiz, which will be handed in to the instructor. Some of these will be used for grading. Students will be informed in advance if the paper or quiz will be graded.

2. **Audio-Visuals**

Several videos will be shown to the class. These videos are chosen for their excellence of presentation and accuracy. The Imaginarium will be used to demonstrate the motion of the stars and the arrangement of constellations.

3. **Participating**

Students are expected to participate fully with the instructor and their classmates through lecture-tutorial exercises, asking questions in class, and contributing to discussion.

4. **Reading**

The basic information source is the textbook (listed below). The class calendar (also listed below) gives dates on which each chapter of the textbook will be covered.

5. **Calculating**

Calculators are not required, but a ruler with both metric and English measurements on it will be needed. Calculators will be helpful for extra credit homework.

ASSESSMENT TASKS AND GRADING

1. There will be three unit Tests, which will be given on the dates indicated on the class calendar. Each test will be worth 25 points, for a total of 75 points for the semester. These tests will be closely coordinated with the classroom discussion and assignments.

2. There will be three Video Essays. The essays will be written responses to an astronomy video that has been shown. The essays will be worth 5 points each, for a total of 15 points.

3. Quizzes. There will be four short quizzes, worth 5 points each, for a total of 20 points.

4. Homework. As indicated above homework will be assigned on Monday and handed in at the beginning of class on Wednesday. **Late homework will not be accepted.** Mr. Kessler will review the homework and return it on the following Monday. Homework does not contribute points to a student's grade, but it is extremely important to do as part of the learning process.

5. Attendance at one Wednesday evening Star Show in the Imaginarium is obligatory. It will be worth 10 points. A brief report must be submitted within one week. A report form is provided at the end of this syllabus. If the student cannot attend the Star Show because of work or other serious commitment, a substitute assignment is available.

6. The Final Exam will be worth 100 points. It will cover select sections of the entire course. A study guide will be provided.

This adds up to a total of 220 possible points, as follows:

Three Tests (25 points each)		75 points
Three Video Essays (5 points each)		15 points
Four Quizzes (5 points each)		20 points
Wednesday Star Show (10 points)		10 points
Final Exam		100 points
	TOTAL	220 points

None of the quizzes or essays may be taken late. The three 25 point tests may be taken late, only if Mr. Kessler is contacted the day of the test or before, and he agrees to this. Mr. Kessler may be contacted by telephone (222-6573) or by email at (mkessler@hawaii.edu). Points earned and course letter grade will be recorded on Laulima.
Correspondence between points and letter grade will be as follows:

A- 90% to 100% of the points,
B- 80% to 89% of the points,
C- 70% to 79%,
D- 60% to 69%,
F- 0 to 59%.

The grading standards given in the 2015-2017 Windward Community College Catalog, page 30, will be followed. The Catalog allows for other assigned grades. **Students are encouraged to consult the instructor at any time about their grade**. As indicated above, grades are available to students on Laulima.

LEARNING RESOURCES

Two books are required:
1. TEXTBOOK: The Cosmic Perspective Fundamentals, *Second Edition, by* Bennett, Donahue, Schneider, and Voit.
2. WORKBOOK: Lecture-Tutorials for ASTR 110 and ASTR 110WI, by Adams, Prather, and Slater.
These books are available at the Windward Community College Bookstore.
Copies of the Videos that are shown in class are on reserve in the library, and some of them may be found on YouTube.

Additional Information

Students are strongly encouraged to spend time outside under the night sky, identifying constellations, planets, the moon and their motions across the sky. There are some excellent applications that can be downloaded to smartphones and used for this.

Students also are encouraged to visit WCC's **AEROSPACE LAB**, located in Hale Imiloa, Room 135. Besides a large collection of astronomy related resource materials

which the student may borrow, there is a hands-on physical science museum. Phone 235-7321 for availability.

Students are directed to the **IMAGINARIUM** (planetarium) to avail themselves of the programs presented there on the second Wednesday of the month at 7:00 PM and the second Friday of the month at 7:00 PM. Tickets may be purchased at the Imaginarium box office 30 minutes before the show, or call 235-7433 to reserve tickets in advance. Reserved tickets must be picked up at the box office at least 15 minutes before showtime, otherwise they may be sold to waiting customers. Scheduled events are listed on the college website.

There is a table in the main hallway of Hale Imiloa that contains handouts (monthly star charts and astronomical events) and a list of internet sites for learning about constellations.

DISABILITIES ACCOMMODATION STATEMENT

If you have a physical, sensory, health, cognitive, or mental health disability that could limit your ability to fully participate in this class, you are encouraged to contact Ann Lemke, the Disability Specialist Counselor, to discuss reasonable accommodations that will help you succeed in this class. Ms. Lemke can be reached at 235-7448, lemke@hawaii.edu, or you may stop by Hale 'Akoakoa 213 for more information.

CLASS CALENDAR FOR FALL 2017

UNIT I The Celestial Sphere

Week 1 August 21 and 23

Monday: Introduction to the course
What would you like to learn from this course?
Imaginarium: "The Celestial Sphere"
Wednesday: Chapter 2, *Understanding the Sky*
Lecture on the celestial sphere and reason for seasons
Lecture-Tutorial workbook: "Position", pp. 1-3
Quiz: what is the celestial sphere?

Week 2 August 28 and 30

Monday: Go over homework from last week.
Assignment of new homework (this will be done each Monday)
Lecture on the difference between daily and annual motion
Wednesday: hand in homework (this will be done each Wednesday)
Complete tutorials in Lecture-Tutorial workbook: "Motion" on pp 3-6, "Seasonal Stars" on pp 7-10, and "Ecliptic" on pp 11-16
Quiz: "The Problem"

Week 3 September 4 and 6

Monday: LABOR DAY-HOLIDAY
Wednesday: Continue chapter 2.
Lecture on: phases of the Moon
LT, pp 25-28: "The Cause of Moon Phases"

Week 4 September 11 and 13

Monday: Continue chapter 2.
Why do eclipses occur? What causes retrograde motion?
Wednesday: Test One

UNIT II TRANSITION

Week 5 September 18 and 20

Monday: Chapter 3, *Changes in Our Perspective*
The Copernican Revolution
Wednesday: Quiz on Copernican Revolution
Lecture on Gravity
How much does the Earth "weigh"?

Week 6 September 25 and 27

Monday: Lecture on Light, page 80 in textbook

Wednesday: **Video**: "Wonders of the Solar System: Aliens"

Post-Video: write an essay on the video

UNIT III The Solar System

Week 7 October 2 and 4

Monday: Chapter 4, *Origin of the Solar System*

Lecture on physical characteristics of the Solar System

Wednesday: continue chapter 4

Lecture on formation of Solar System

Week 8 October 9 and 11

Monday: Chapter 5, *Terrestrial Worlds*

Focus is on the similarities and differences between Venus, Earth, and Mars

Wednesday: **Video**, *Wonders of the Solar System: Dead or Alive?*

Post-Video Essay: "Why are Earth, Venus, and Mars so different from each other?

Week 9 October 16 and 18

Monday: Chapter 6, *The Outer Solar System,* section 6.2 on Asteroids, Comets, and the Impact Threat

Wednesday: Test Two

Review of scientific notation called "Powers of 10".

UNIT IV The Stars

Week 10 October 23 and 25

Monday: Chapter 8: *The Sun and Other Stars*

Luminosity/Distance Formula

Wednesday: continue chapter 8

LT, pp 33-36, on Blackbody Radiation, Parts I and II

Week 11 October 30 and November 1

Monday: Spectral classification of stars

Wednesday: The Hertzsprung-Russell Diagram

LT, pp 29-32: "Luminosity, Temperature, and Size: Part I and II"

LT, pp 47-48: "H-R Diagram"

Quiz on Luminosity, Temperature, Distance, and Size

Week 12 November 6 and 8

Monday: Chapter 9, *Stellar Lives*

Go over notes on the Lifeline of stars.

Wednesday: continue Chapter 9.

Quiz on Lifeline of Stars

Week 13 November 13 and 15

Monday: White Dwarfs, Neutron Stars, and Black Holes.

LT, pp 49-50, "Stellar Evolution"

Wednesday: Test Three

UNIT V The Galaxies

Week 14 November 20 and 22

Monday: Chapter 11, *Galaxies*.

LT, pp 51-54: "Milky Way Scales"

Wednesday: Chapter 12, *Galaxy Distances and Hubble's Law*

The distance chain

Week 15 November 27 and 29

Monday: Chapter 15, *Life in the Universe*

Wednesday: **Video**: "Known Universe: Biggest and Smallest"

Post-Video Essay

Week 16 December 4 and 6

Monday: Review

Wednesday: Review

Week 17 FINAL EXAM WEEK December 11 to 16

The above schedule has been carefully thought out and will be followed as much as possible, but there may have to be adjustments as the semester progresses.
The Instructor will inform students of any changes at least one class day in advance. If a student is absent from class when changes are announced, it is the student's responsibility to find out about the changes

REPORT

This can be used to report on attendance at Star Shows in the Imaginarium and at Observing Sessions with the telescope. Obtain signature of one of the attending staff.
You may use the reverse side of this page.

Attending Staff: _____ Date: _____

Description of the show or observing session:

Sketches of Constellations, Planets, other objects seen in the session:

What I found interesting (at least 100 words; may use reverse side of page):

Student Signature_____